At these points, change "medium" to --ocean-volume-- (note the hyphen):

claim 41, at line 7;
claim 48, at lines 4 and 7;
claim 49, at line 8;
claim 50, at lines 3 and 5;
claim 66, at line 14; and
claim 72, at line 6.

Please change claims 33, 36, 38, 40, 64 and 67, and add new claims 73 through 98, all to read as indicated below.

(For the Examiner's convenience the new claims have been inserted in the claim sequence at these points where they are desired:

claims 73 through 83 following claim 33;
claims 84 through 88 following claim 38;
claims 89 through 92 following claim 56;
claim 93 following claim 67; and
claims 94 through 98 following claim 72.)

SUB C17

B1 cont

33. (amended) An imaging system for forming an image of a thin section of a turbid medium, namely a thin section of ocean volume, with objects therein, said system comprising:

means for projecting a pulsed thin-fan-shaped beam to selectively illuminate, along an illumination-propagation direction, a thin section of such turbid ocean volume [medium];

a streak tube, having a cathode for receiving reflected light back, approximately along the illumination-propagation

direction, from the thin section of turbid ocean volume [medium]; said streak tube also having an anode end, and comprising:

first electronic means for forming at the anode end of the streak tube successive thin-strip-shaped electronic-image segments of the light successively received on the cathode from the illuminated turbid-ocean-volume [medium] thin section, and

second electronic means for distributing the successive thin-strip-shaped electronic-image segments, along a direction generally perpendicular to a long dimension of the image segments, across the anode end of the streak tube,

said distributing of the electronic-image segments being in accordance with elapsed time after operation of the beam-projecting means so that each thin-strip-shaped electronic-image segment is displaced from a side of the anode end of the tube substantially in proportion to total propagation distance and time into and out from the turbid-medium thin section, to form a composite electronic image of the turbid-ocean-volume [medium] thin section as a function of propagation depth.

B2 cont

~~73. (to follow claim 33) The system of claim 33, further comprising:~~

~~means for imposing a substantially common spatial definition and directional restriction, in one dimension, upon (1) the pulsed ~~thin-fan~~-shaped beam projected by the projecting means and (2) the reflected light received back from the thin section of turbid ocean volume.~~

c

8. ~~74.~~ (to follow claim 73) The system of claim 5 ~~33~~ ~~73~~, wherein the common-restriction-imposing means comprise:

means for constraining, in said one dimension, the field from which said reflected light can reach said streak-tube cathode; and

means for aligning, with respect to said one dimension, the field-constraining means with the thin-fan-shaped beam.

9. ~~75.~~ (to follow claim 74) The system of claim 8 ~~74~~, wherein:

the field-constraining means comprise an optical slit that is narrow in said one dimension; and

the aligning means comprise means for aligning, with respect to said one dimension, the slit with the thin-fan-shaped beam.

10. ~~76.~~ (to follow claim 75) The system of claim 9 ~~75~~, wherein the common-restriction-imposing means further comprise:

means for limiting, with respect to said one dimension, the field illuminated by the thin-fan-shaped beam.

B2 cont

11. ~~77.~~ (to follow claim 76) The system of claim 10 ~~76~~, wherein:

the beam-field-limiting means comprise an anamorphic optical element for asymmetrically expanding a laser beam with cross-section on the order of a centimeter to strike an area on the ocean surface of a few meters by more than one thousand meters.

SUBC2

78. (to follow claim 77) The system of claim 33, further comprising:

means for bodily displacing the beam-projecting means and streak tube together, along a direction generally perpendicular to a long dimension of the thin section of turbid ocean volume, while sequentially operating the beam-projecting means to project a sequence of beam pulses to illuminate successive thin sections, and generate a corresponding sequence of composite electronic images;

means for processing the composite electronic images to produce a corresponding sequence of composite optical images, and for visually displaying the sequence of composite optical images to show a motion picture that emulates visual perceptions of travel through the successive thin sections of turbid ocean volume.

~~79~~ 13. (to follow claim 78) The system of claim ~~78~~ 12, wherein:

the bodily-displacing means comprise an aircraft supporting the beam-projecting means and streak tube together and flying above the ocean along said direction generally perpendicular to a long dimension of the thin section of turbid ocean volume;

said beam-projecting means project said sequence of beam pulses downward from said aircraft, through air above the turbid ocean volume, and then downward into the turbid ocean volume; and

said reflected light received back from the thin section of turbid ocean volume passes upward from the turbid ocean volume, through air above the turbid ocean volume, to said aircraft.

~~80~~ 14. (to follow claim 79) The system of claim ~~79~~ 13, wherein:

a centerline of every beam pulse is substantially in a plane defined by (1) said direction of flight and (2) a vertical line; and

a centerline of said reflected light received back from the thin section of turbid ocean volume is substantially in the same plane.

15, ~~81.~~ (to follow claim 80) The system of claim 13 ~~79,~~ wherein:

said beam-projecting means effectively illuminate such objects in the thin section of turbid ocean volume;

said beam-projecting means do not effectively illuminate portions of the thin section of turbid ocean volume immediately below such objects;

said cathode effectively receives said reflected light back from such illuminated objects;

B2 Cont

said cathode does not effectively receive reflected light back from the thin section of turbid ocean volume immediately below such objects;

said composite electronic images and composite optical images include images of such illuminated objects, and of the turbidity in the thin section of turbid ocean volume, arising from said effectively received reflected light; and

said composite-optical-image motion picture includes shadow images below such illuminated objects, arising from absence of effectively received reflected light from said thin section of turbid ocean volume immediately below such illuminated objects.

16. ~~82.~~ (to follow claim 81) The system of claim 12 ~~78~~, wherein:

said beam-projecting means effectively illuminate such objects in the thin section of turbid ocean volume;

said beam-projecting means do not effectively illuminate portions of the thin section of turbid ocean volume immediately behind such objects;

said cathode effectively receives said reflected light back from such illuminated objects;

B2 cont

said cathode does not effectively receive reflected light back from the thin section of turbid ocean volume immediately behind such objects;

said composite-optical-image motion picture includes images of such illuminated objects, and of the turbidity in the thin section of turbid ocean volume, arising from said effectively received reflected light; and

said composite-optical-image motion picture includes shadow images behind such illuminated objects, arising from absence of effectively received reflected light from said thin section of turbid ocean volume immediately behind such illuminated objects.

SUB C3

83. (to follow claim 82) The system of claim 33, wherein:

said beam-projecting means effectively illuminate such objects in the thin section of turbid ocean volume;

said beam-projecting means do not effectively illuminate portions of the thin section of turbid ocean volume immediately behind such objects;

said cathode effectively receives said reflected light back from such illuminated objects;

B7 cont

said cathode does not effectively receive reflected light back from the thin section of turbid ocean volume immediately behind such objects;

said composite electronic image includes images of such illuminated objects, and of the turbidity in the thin section of turbid ocean volume, arising from said effectively received reflected light; and

said composite electronic image includes shadow images behind such illuminated objects, arising from absence of effectively received reflected light from said thin section of turbid ocean volume immediately behind such illuminated objects.

SUBC4

36. (amended) An imaging system for forming an image of a thin section of a turbid medium, namely a thin section of ocean volume, with objects therein, said system comprising:

means for projecting a pulsed thin-fan-shaped beam to selectively illuminate, along an illumination-propagation direction, a thin section of such turbid ocean volume [medium]; said beam penetrating and propagating within the thin section during a first range of times corresponding to beam propagation depth into the thin section;

B3 cont

a streak tube, having a cathode for receiving reflected light back, approximately along the illumination-propagation direction, from the thin section of turbid ocean volume [medium] during a second range of times corresponding to total propagation distances into and out from the thin section approximately along the illumination-propagation direction; said streak tube also having an anode end, and comprising:

first electronic means for forming at the anode end of the streak tube successive thin-strip-shaped electronic-image segments of the light successively received on the cathode from the illuminated turbid-ocean-volume [medium] thin section, at particular times corresponding to the particular total propagation distances for particular penetration depths, and

second electronic means for distributing the successive thin-strip-shaped electronic image segments, along a

B3 concld

direction generally perpendicular to a long dimension of the images, across the anode end of the streak tube in accordance with said second range of times corresponding to total propagation distances into and out from the thin section of turbid ocean volume [medium], to form a composite electronic image of the turbid-ocean-volume [medium] thin section as a function of propagation depth.

SUBC5

38. (amended) The system of claim 37, further comprising:

means for bodily displacing the beam-projecting means and streak tube together, along a direction generally perpendicular to a long dimension of the thin section of turbid ocean volume [medium], while sequentially operating the beam-projecting means to project a sequence of beam pulses to illuminate successive thin sections, and generate a corresponding sequence of composite electronic images; and

means for processing the composite electronic images to produce a corresponding sequence of composite optical images, [;] and [means] for visually displaying the sequence of said composite optical images to show a motion picture that emulates visual perceptions of travel through the successive thin sections of turbid ocean volume [medium].

B4 concld

~~84.~~ 21. (to follow claim 38) The system of claim ~~38~~ 20, wherein:

the bodily-displacing means comprise an aircraft supporting the beam-projecting means and streak tube together and flying above the ocean along said direction generally perpendicular to a long dimension of the thin section of turbid ocean volume;

said beam-projecting means project said sequence of beam pulses downward from said aircraft, through air above the turbid ocean volume, and then downward into the turbid ocean volume; and

said reflected light received back from the thin section of ocean volume passes upward from the ocean volume, through air above the ocean volume, to said aircraft.

~~85.~~ 22. (to follow claim 84) The system of claim ~~84~~ 21, wherein:

a centerline of every beam pulse is substantially in a plane defined by (1) said direction of flight and (2) a vertical line; and

D

a centerline of said reflected light received back from the thin section of turbid medium is substantially in the same plane.

~~86~~ 23. (to follow claim 85) The system of claim ~~84~~ 21, wherein:

said beam-projecting means effectively illuminate such objects in the thin section of turbid ocean volume;

said beam-projecting means do not effectively illuminate portions of the thin section of turbid ocean volume immediately below such objects;

said cathode effectively receives said reflected light back from such illuminated objects;

said cathode does not effectively receive reflected light back from the thin section of turbid ocean volume immediately below such objects;

said composite electronic images and composite optical images include images of such illuminated objects, and of the turbidity in the thin section of turbid ocean volume, arising from said effectively received reflected light; and

said composite-optical-image motion picture includes shadow images below such illuminated objects, arising from absence of effectively received reflected light from said thin section of turbid ocean volume immediately below such illuminated objects.

~~87.~~ 24. (to follow claim 86) The system of claim ~~38~~ 28, wherein:

said beam-projecting means effectively illuminate such objects in the thin section of turbid ocean volume;

said beam-projecting means do not effectively illuminate portions of the thin section of turbid ocean volume immediately behind such objects;

said cathode effectively receives said reflected light back from such illuminated objects;

said cathode does not effectively receive reflected light back from the thin section of turbid ocean volume immediately behind such objects;

B5 Cont

said composite-optical-image motion picture includes images of such illuminated objects, and of the turbidity in the thin section of turbid ocean volume, arising from said effectively received reflected light; and

said composite-optical-image motion picture includes shadow images behind such illuminated objects, arising from absence of effectively received reflected light from said thin section of turbid ocean volume immediately behind such illuminated objects.

SUB C6

88. (to follow claim 87) The system of claim 36, wherein:

said beam-projecting means effectively illuminate such objects in the thin section of turbid ocean volume;

said beam-projecting means do not effectively illuminate portions of the thin section of turbid ocean volume immediately behind such objects;

said cathode effectively receives said reflected light back from such illuminated objects;

B5

said cathode does not effectively receive reflected light back from the thin section of turbid ocean volume immediately behind such objects;

Concl

said composite electronic image includes images of such illuminated objects, and of the turbidity in the thin section of turbid ocean volume, arising from said effectively received reflected light; and

said composite electronic image includes shadow images behind such illuminated objects, arising from absence of effectively received reflected light from said thin section of turbid ocean volume immediately behind such illuminated objects.

c B6 conc

~~40.~~ 25. (amended) The system of claim ~~39~~ 18 further comprising: means for roughly compensating for geometrical effects such as increased path length to beam-pattern ends, or cosine losses on illumination and on return, that systematically vary the intensity of reflected light, along the long dimension of the thin section of turbid ocean volume [medium].

SUB E8

B7 conc

89. (to follow claim 56) The system of claim 56, wherein:

the bodily-displacing means comprise an aircraft supporting the beam-projecting means and streak tube together and flying above the turbid ocean volume along said direction generally perpendicular to a long dimension of the thin section of turbid ocean volume;

said beam-projecting means project said sequence of beam pulses downward from said aircraft, through air above the turbid ocean volume, and then downward into the turbid ocean volume; and

said reflected light received back from the thin section of turbid ocean volume passes upward from the turbid ocean volume, through air above the turbid ocean volume, to said aircraft.

~~90.~~ 33, (to follow claim 89) The system of claim ~~89,~~ 32, wherein:

a centerline of every beam pulse is substantially in a plane defined by (1) said direction of flight and (2) a vertical line; and

a centerline of said reflected light received back from the thin section of turbid ocean volume is substantially in the same plane.

~~91.~~ 34. (to follow claim 90) The system of claim ~~89~~ 32, wherein:

said beam-projecting means effectively illuminate such objects in the thin section of turbid ocean volume;

said beam-projecting means do not effectively illuminate portions of the thin section of turbid ocean volume immediately below such objects;

said cathode effectively receives said reflected light back from such illuminated objects;

said cathode does not effectively receive reflected light back from the thin section of turbid ocean volume immediately below such objects;

said video sequence, displayed by the electronic-image-sequence using means, includes visible images of:

> such illuminated objects, and of the turbidity in the thin section of turbid ocean volume, arising from said effectively received reflected light, and
>
> shadows below such illuminated objects, arising from absence of effectively received reflected light from said thin section of turbid ocean volume immediately below such illuminated objects.

~~92.~~ 35. (to follow claim 91) The system of claim ~~56~~ 31, wherein:

B7

said beam-projecting means effectively illuminate such objects in the thin section of turbid ocean volume;

said beam-projecting means do not effectively illuminate portions of the thin section of turbid ocean volume immediately behind such objects;

said cathode effectively receives said reflected light back from such illuminated objects;

said cathode does not effectively receive reflected light back from the thin section of turbid ocean volume immediately behind such objects;

said video sequence, displayed by the electronic-image-sequence using means, includes visible images of:

concl

> such illuminated objects, and of the turbidity in the thin section of turbid ocean volume, arising from said effectively received reflected light, and
>
> shadows behind such illuminated objects, arising from absence of effectively received reflected light from said thin section of turbid ocean volume immediately behind such illuminated objects.

SUB E9

64. (amended) An imaging system for forming an image of a thin section of a turbid medium, namely a thin section of ocean volume, with objects therein, said system comprising:

means for projecting a pulsed thin-fan-shaped beam to selectively illuminate a thin section of such turbid ocean volume [medium];

a streak-tube cathode for receiving reflected light back, approximately along the illumination-propagation direction, from the thin section of turbid ocean volume [medium];

means for focusing the reflected light onto the streak-tube cathode substantially directly;

said focusing means comprising:

B8 cont

(1) no "glass plate stack" image slicer for optically mapping portions of said reflected light onto portions of a light-receiving surface, and

(2) no other type of image slicer for optically mapping portions of said reflected light onto portions of a light-receiving surface, and

(3) no pixel-encoding fiber bundle for optically mapping a two-dimensional reflected image into a line image, and

(4) no other pixel-encoding fiber bundle for optical mapping of a reflected image, and

(5) [(3)] no other optical image-mapping [-remapping] device other than basic optical elements such as a lens or mirror; and

streak-tube means, responsive to the focused reflected light, for forming therefrom a corresponding composite electronic image of the turbid-ocean-volume [medium] thin section as a function of propagation depth.

SUBC11

67. A method of imaging a turbid medium, namely a thin section of ocean volume, with objects therein, said method comprising the steps of:

projecting a pulsed thin-fan-shaped beam to selectively illuminate, along an illumination-propagation direction, a thin section of such turbid ocean volume [medium];

then at a substantially common location with the projecting step, receiving reflected light back, approximately along the illumination-propagation direction, from the thin section of turbid ocean volume [medium];

forming successive thin-strip-shaped image segments which are respectively images of the reflected light successively received along approximately the illumination-propagation direction;

distributing the successive thin-strip-shaped image segments, along a direction generally perpendicular to a long dimension of the images;

said distributing of the image segments being in accordance with elapsed time after the beam-projecting step so that each thin-strip-shaped image segment is displaced from a common baseline position substantially in proportion to total propagation distance and time into and out from the turbid ocean volume [medium], to form a composite image of the turbid-ocean-volume [medium] thin section as a function of propagation depth;

[after the projecting and receiving steps,] shifting said common location in a direction roughly [substantially] at right

angles to both (1) a long dimension of the thin-fan-shaped beam and (2) the illumination-propagation direction;

repeating all of the above steps multiple times [, with at least the projecting, receiving and shifting steps in the indicated order,] to form multiple composite images of progressively encountered turbid-ocean-volume [medium] thin sections as a function of propagation depth.

---

47. ~~93.~~ (to follow claim 67) The method of claim ~~67~~ 41, wherein:

said common-location-shifting step is after the projecting and receiving steps; and

at least the projecting, receiving and shifting steps are in that order.

B10

94. An imaging system for forming an image of a thin section of a turbid medium with objects therein, said system comprising:

means for projecting a pulsed thin-fan-shaped beam to selectively illuminate, along an illumination-propagation direction, a thin section of such turbid medium;

a streak tube, having a cathode for receiving reflected light back, approximately along the illumination-propagation direction, from the thin section of turbid medium; said streak tube also having an anode end, and comprising:

first electronic means for forming at the anode end of the streak tube successive thin-strip-shaped electronic-image segments of the light successively received on the cathode from the illuminated turbid-medium thin section, and

second electronic means for distributing the successive thin-strip-shaped electronic-image segments, along a direction generally perpendicular to a long dimension of the image segments, across the anode end of the streak tube,

B13 Cont

said distributing of the electronic-image segments being in accordance with elapsed time after operation of the beam-projecting means so that each thin-strip-shaped electronic-image segment is displaced from a side of the anode end of the tube substantially in proportion to total propagation distance and time into and out from the turbid-medium thin section, to form a composite electronic image of the turbid-medium thin section as a function of propagation depth; and

means for imposing a substantially common spatial definition and directional restriction, in one dimension, upon (1) the pulsed thin-fan-shaped beam projected by the projecting means and (2) the reflected light received back from the thin section of turbid medium.

95. The system of claim 94, wherein the common-restriction-imposing means comprise:

means for constraining, in one dimension, the field from which said reflected light can reach said streak-tube cathode; and

means for aligning the field-constraining means, with respect to said one dimension, with the thin-fan-shaped beam.

B10
cont

96. The system of claim 95, wherein:

the field-constraining means comprise an optical slit that is thin in said one dimension; and

the aligning means comprise means for aligning the slit, with respect to said one dimension, with the thin-fan-shaped beam.

97. The system of claim 96, wherein the common-restriction-imposing means further comprise:

means for limiting, in said one dimension, the field illuminated by the thin-fan-shaped beam.